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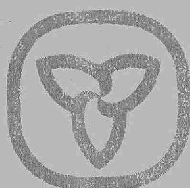
MERCURY CONCENTRATIONS IN  
GARDEN LAKE SEDIMENT

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MERCURY CONCENTRATIONS IN GARDEN LAKE SEDIMENT

by

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WATER RESOURCES ASSESSMENT

TECHNICAL SUPPORT SECTION

NORTHWESTERN REGION

MINISTRY OF THE ENVIRONMENT

AUGUST 1976

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## INTRODUCTION

The Ministry of the Environment was requested on May 20, 1976, by the Grassy Narrows Indian Band near Kenora to investigate Garden Lake water and sediments with respect to mercury concentrations. Apparently fish from Garden Lake have shown levels above 0.5 ppm, the limit set by the Canadian Federal Food Drug Directorate as acceptable for steady consumption and this prevented the Band's undertaking a fish farming project. Because mercury levels in sediment and water are responsible for mercury concentrations found in fish, a study was undertaken in July, 1976 to assess mercury levels in Garden Lake sediment and water.

## DESCRIPTION OF AREA

Garden Lake, a small (approximately  $1 \text{ km}^2$ ) relatively shallow (mean depth approximately 5 m) lake, is situated on the Grassy Narrows Indian Reserve northeast of Kenora.

## SAMPLING METHODS

Because mercury concentrations in sediment are more variable than in water and act as a reservoir in a lake ecosystem, the main emphasis in this study was to determine sediment concentrations. In July, 1976, 18 sediment samples were taken with a phleger corer to be analysed for mercury. Three samples were taken one metre apart at each of six stations, (see attached map). The cores were frozen and shipped to the Ministry of the Environment Lab in Toronto for analysis. Water samples were taken in triplicate from the lake centre, 1 metre from the top and 1 metre from the bottom and were analysed in the Thunder Bay Regional Laboratory.

## RESULTS

Sediment results are shown in the attached table. Since 3 cores which were analysed to depths of over 20 cm displayed low mercury concentrations, subsequent cores were analysed to the 6 cm depth only. Sediment consisted primarily of clay and silt with 0.5 - 1 cm of organic matter at the water-sediment interface. From the results it is evident that mercury concentrations in these sediments are the same as other off-system lakes in the English-Winnipeg River system and are low when compared to contaminated lakes in this area (ie. mean of mercury concentration in surface sediment of Clay Lake is 3.1 ppm). As Garden Lake was practically undisturbed by human activity until the 1960's, any mercury contamination would be most evident in the upper 1 - 2 cm of sediment, (assuming a normal sedimentation rate of 1 mm/year). The results indicate no surface enrichment. The mercury concentration of water samples from Garden Lake was less than .05 ppb, typical of non-contaminated lakes.

## CONCLUSIONS

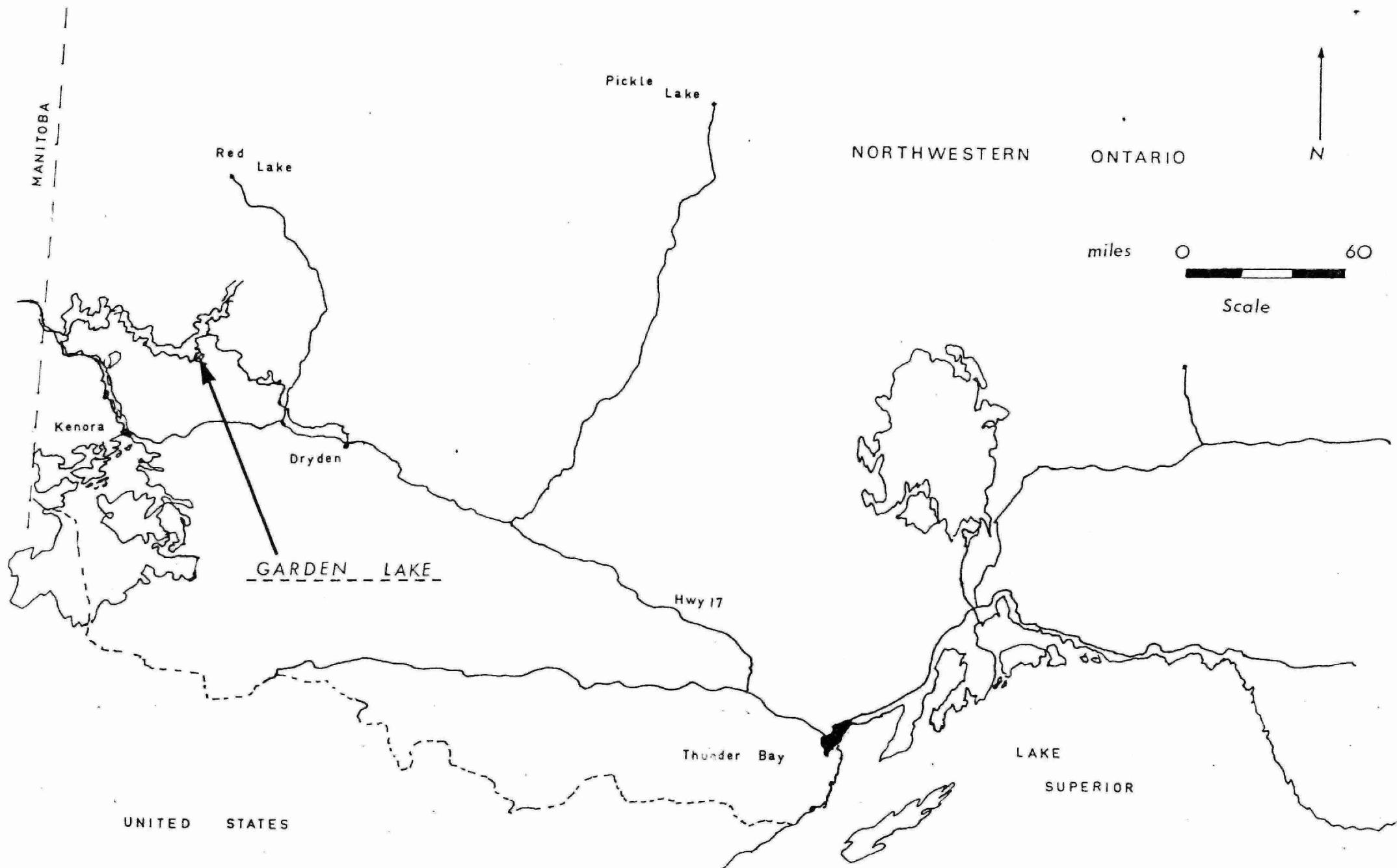
Since mercury concentrations in Garden Lake sediment and water are low and surficial sediment enrichment is not evident, it can be concluded that mercury in Garden Lake is of natural origin. Thus any dredging of sediment in this lake would have no appreciable effect in altering mercury concentrations found in fish flesh.

MERCURY CONCENTRATIONS (ppm) IN GARDEN LAKE SEDIMENT

Sediment Depth (cm)	Station					
	B-1	B-2	B-3	A-1	A-2	A-3
0-2	.16	<.05	<.05	<.05	<.05	<.05
2-4	.27	<.05	<.05	.07	<.05	<.05
4-6	.14	<.05	<.05	.06	<.05	<.05
6-10	.24	<.05	<.05			
10-20	<.05	<.05	<.05			
	C-1	C-2	C-3	D-1	D-2	D-3
0-2	<.05	.06	.05	<.05	.09	.11
2-4	.11	.08	.08	.11	.06	.11
4-6	.09	.07	.09	.13	.10	.07
	E-1	E-2	E-3	F-1	F-2	F-3
0-2	<.05	.10	.09	<.05	.07	<.05
2-4	.07	.09	.12	.08	<.05	.07
4-6	.08	<.05	.10	.07	<.05	<.05

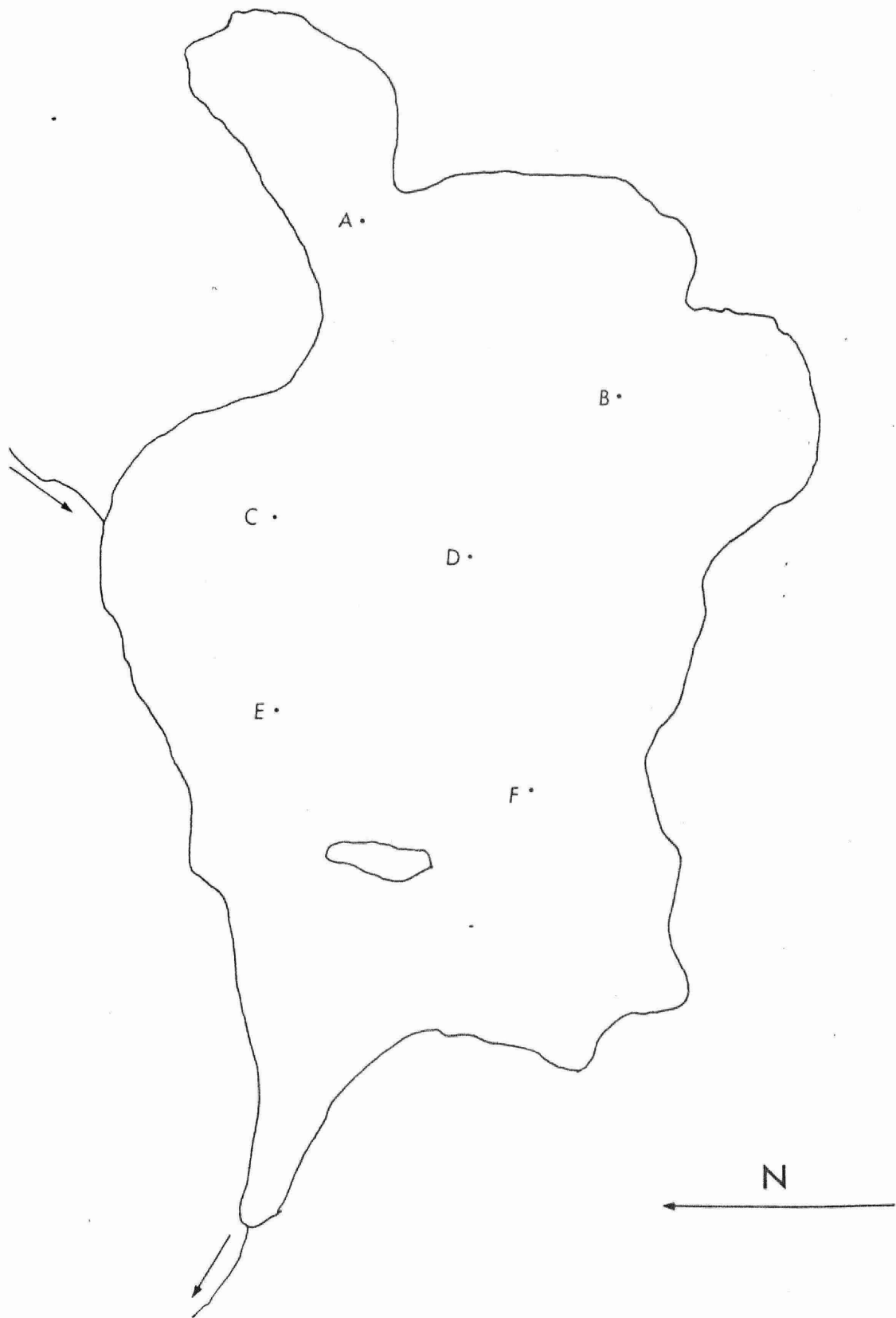
MERCURY CONCENTRATIONS (ppm) IN OFF SYSTEM  
LAKE SEDIMENT (TOP 5 cm)

LAKE	CONCENTRATION
Keys	.01
Toothpick	.12
Delaney	.10
Snowshoe	.13
Eagle	.02
Blueberry	.14
Sand	.38
Gooseneck	.31
Black Sturgeon	.08
Gun	.20



# GARDEN LAKE

sampling sites .



scale : 14 cm = 1 km





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